Experimental Verification of the Takagi-Sugeno Fuzzy Logic PI Controller in Stabilization of Angular Velocity of a DC Motor Subject to Irregular Loading

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Abstract: Fuzzy logic control algorithms are regarded to as a relatively new concepts in modern control theory. This paper presents a comparative analysis of two qualitatively different approaches used for angular velocity control of a DC motor subject to chaotic disturbances coming from a gear with a transmission belt carrying a vibrating load. The purpose is to achieve an accurate control of speed of the DC motor (a plant), especially, when the motor parameters and some external loading conditions are partially unknown. First, the classical approach based on the PID control is considered, and then, a fuzzy logic based alternative is proposed. Two different controllers are developed for the purpose of completion of this paper: the classical PID controller and a Takagi-Sugeno type fuzzy logic PI controller. Both control algorithms are implemented on an 8-bit AVR ATmega644PA microcontroller. On the basis of step responses of the plant an analysis as well as an interesting comparison of the controllers' performance has been presented.